2008-07

N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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http://hdl.handle.net/2027.42/64943
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Research Design

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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

Causality

A  \[\rightarrow\]  B
Pressure  \[\rightarrow\]  Ulcer

Multicausality

Years smoking  \[\rightarrow\]  Heart disease
High fat diet  \[\rightarrow\]  Heart disease
Limited exercise  \[\rightarrow\]  Heart disease
• Probability: Likelihood of an outcome
• Bias: Slanting findings
• Manipulation: Treatment
• Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- **Controlling the treatment**
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

- **Is there a treatment?**
  - **Yes**: Quasi-Experimental Study
  - **No**: Descriptive Design

  - **Descriptive Design**
    - Is the primary purpose examination of relationships?
      - **No**: Experimental Study
      - **Yes**: Quasi-Experimental Study

  - **Quasi-Experimental Study**
    - Will the sample be studied as a single group?
      - **No**: Experimental Study
      - **Yes**: Is the treatment tightly controlled by the researcher?
        - **No**: Experimental Study
        - **Yes**: Will a randomly assigned control group be used?
          - **No**: Experimental Study
          - **Yes**: Is the original sample randomly selected?
            - **No**: Experimental Study
            - **Yes**: Experimental Study

  - **Experimental Study**
    - Correlational Design
Selecting a Descriptive Design

Examining sequences across time?

No
- One Group?
  - No
  - Comparative Descriptive Design
  - Yes
  - Descriptive Design

Yes
- Following same subjects across time?
  - No
  - Data collected across time
  - Yes
  - Single unit of study
    - No
    - Studying events partitioned across time?
      - Yes
      - Longitudinal Study
      - No
      - Trend Analysis
        - Yes
        - Repeated measures of each subject
          - Yes
          - Cross-sectional design with treatment partitioning
            - No
            - Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarification ➔ Measurement ➔ Description ➔ Interpretation

Phenomenon of Interest

- Variable 1
- Description of Variable 1
- Interpretation of Meaning
- Development of Hypotheses

- Variable 2
- Description of Variable 2

- Variable 3
- Description of Variable 3

- Variable 4
- Description of Variable 4
A Comparative Descriptive Design

Group I
{variables measured}

Group II
{variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Development of Hypotheses
## Selecting the Type of Correlational Design

<table>
<thead>
<tr>
<th>Describe relationships between/among variables?</th>
<th>Predict relationships between/among variables?</th>
<th>Test theoretically proposed Relationships?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Descriptive correlational design</strong></td>
<td><strong>Predictive correlational design</strong></td>
<td><strong>Model testing design</strong></td>
</tr>
</tbody>
</table>
A Descriptive Correlational Design

Measurement

- Research Variable 1
- Research Variable 2

Description of variable

Examination of Relationship

Interpretation of Meaning

Development of Hypotheses
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Experimental Design

- **Pretest**
  - No: Post-test only control group design
  - Yes: Repeated Measurements?
    - No: Examine effects of confounding variables?
      - No: Multiple sites?
        - Yes: Randomized clinical trials
          - No: Pretest/post-test control group design
          - Yes: Randomized Block Design
        - Yes: Comparison of multiple levels of treatment
          - No: Examination of complex relationships among variables in relation to treatment
          - Yes: Nested Designs
    - Yes: Repeated measures design
# Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:**
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

**Example:** Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

**Uncontrolled threats to validity:**
- Testing
- Mortality

**Instrumentation:** Restricted generalizability as control increases
### Post-Test-Only Control Group Design

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<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
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</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td></td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:** Instrumentation, Mortality, Limited generalizability as control increases
### Nested Design

#### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
<th>New approach: “Around the clock” medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit B</td>
<td>Unit C</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
<td>Unit G</td>
</tr>
<tr>
<td>Unit D</td>
<td></td>
<td>Unit H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Primary Nursing Care</th>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td></td>
<td></td>
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<tr>
<td>Unit B</td>
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Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design